PATENT SPECIFICATION

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COMPLETE SPECIFICATION

Improvements in Power Plant

We, SOCIETE D'ETUDES DE MACHINES THERMIQUES, a body corporate organised under the laws of France, of 7, rue Auber, Paris, France, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to internal-combustion power plant of the kind comprising electric generators adapted to be driven independently of the ordinary load to which the plant is coupled. Power plants of this kind are commonly used for ship propulsion.

Electric power requirements on board ship are particularly high when the ship is in port, because of the necessity of supplying electrically operated handling, hoisting and like gear at such times. In the past auxiliary electric power plants were generally provided for this purpose on board ship; this however is uneconomical in view of the expense involved in providing such auxiliary power plants which moreover are operated under full load capacity for only comparatively short periods, namely while the ship is in harbour.

Accordingly, in more recent years, a ship's power plant has been proposed which comprises a number of similar engines, for instance three identical Diesel engines, the drive torque from which is transmitted to the ship's screw through a common reducer gear; two of the engines are arranged to drive the reducer gear through pinions, with a clutch interposed between each engine and the gear, the third engine being adapted to be selectively coupled by clutch means either to an electric generator or, through a pinion, with the reducer gear. Such power plant, while having definite advantages over the older arrangement involving the provision of a separate auxiliary electric plant, is not wholly satisfactory, especially because it requires much space in the direction of its longitudinal axis, and also because it lacks flexibility in use.

It has also been previously proposed to provide a large marine propulsion Diesel power plant comprising, for each of the ship's screws, two parallel pairs of single-crankshaft reciprocating engines, the two engines of each pair being arranged in line with each other, with their adjacent ends jointly driving, through clutches, a single pinion of a centrally located reduction gear common to all four engines between the latter and the screw propeller shaft. Two of the four engines have their ends remote from the reduction gear permanently coupled to two electric generators respectively, so that each generator is driven by a complete engine.

The object of the present invention is to provide an improved power plant of the general kind referred to above which, by suitable design, can be made less space-consuming, more flexible and versatile in use, and generally more advantageous than previous plants of this kind.

A power plant according to this invention comprises one or more multi-crankshaft engines, clutch means at one end of the crankshafts of said engine or engines for coupling them to a common load, preferably through a speed reducer, two or more electric generators, and clutch means for coupling each of said generators to a different one of said crankshafts at the end thereof opposite to the end to which the load is adapted to be coupled.

By "multi-crankshaft engine" is herein understood an engine having a plurality of crankshafts, each driven by one or more banks of cylinder-and-piston units all of which form part of the same engine.

One embodiment of the invention will now be described by way of example with reference to the accompanying diagrammatic drawings, in which:—

Fig. 1 is an end view of a power plant according to the invention suitable for use in a ship;

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Fig. 2 is a side elevation of the power plant shown in Fig. 1; and

Fig. 3 is a top plan thereof.

In the embodiment shown in the drawings, the multi-crankshaft engine, which is designated 1, has four crankshafts 2, 3, 4 and 5. The uppermost crankshafts 2 and 3 are driven by twin banks of cylinder- and piston units in V-arrangement, whereas the lowermost crankshafts 4 and 5, which are in the same horizontal plane, are driven by single banks of such units. The crankshafts 2, 3, 4 and 5 are coupled at one end thereof through clutches 6, 7, 8 and 9 respectively with a speed reducer gear 10 driving a propeller shaft 11. The two lowermost crankshafts 4 and 5 are provided, at the end thereof opposite to that at which the reducer gear 10 is arranged, with clutches 12 and 13 respectively of any suitable kind through which they are releasably coupled with electric generators 14 and 15 respectively operable independently of each other.

It will be seen that when it is required to produce electric power, one or both of the clutches 8 and 9 can be disengaged, and the corresponding clutch 12 or 13 or both engaged, whereupon one or both of the generators 14 and 15 can be put into operation.

Among the advantages of the above described embodiment of the invention, in addition to reduced space requirements, the following may be mentioned:—each generator may be used as an electric motor which may be supplied with electric current from other generating means during normal cruising of the ship. The additional power thus obtained is then directly transmitted to the ship's screw, and assists in propelling the ship. Moreover the generators may be used as additional braking means. A generator may also serve as a source of current for energising an electric engine starter, used for starting for example other engines or engine banks of the power plant. Once these are started, current may continue to be supplied to the generator, which may thus continue to act as a motor. The compressed air starting means conventionally used for starting the engines may be dispensed with, provided a suitable auxiliary source of current is available for the initial starting of an engine or engine bank coupled to a generator.

A generator may be provided for each of the crankshafts, or for each of the lower crankshafts only, or again for each of two superposed or vertically spaced crankshafts.

In the embodiment described, each of the two upper crankshafts is driven by a twin bank of cylinder-and-piston units and the lower crankshafts are each driven by a single bank. Thus the power available on each of the lower crankshafts (to which the generators are coupled) will then be one sixth of the total power output of the plant. It is found that such a ratio for the power output of the generator compared to the total power output of the plant is particularly well suited for supplying the electrical load required by ships in port. This arangement has the further advantage that the starting torque available will be from about 1/4 to 1/5 of the normal engine torque, so that the electrical starting operation is considerably facilitated.

One of the generators may serve for stand-by or reserve purposes.

It will be understood that while the invention has been described and shown as applied to a power plant comprising a multi-crankshaft Diesel engine this, while constituting a preferred embodiment, is by no means essential, and other types of multi-crankshaft engine may be used. It should also be understood that the invention is not restricted to use in power plants for ships, and is applicable to power plants for other vehicles and also to stationary power plants.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. An internal combustion power plant comprising one or more multi-crankshaft engines, clutch means at one end of the crankshafts of said engine or engines for coupling them to a common load, preferably through a speed reducer, two or more electric generators, and clutch means for coupling each of said generators to a different one of said crankshafts at the end thereof opposite to the end to which the load is adapted to be coupled.

2. A power plant as claimed in Claim 1, wherein the or each multi-crankshaft engine includes two lowermost crankshafts in a common horizontal plane, each driven by a single bank of cylinder-and-piston units and each having one of said generators coupled thereto.

3. A power plant as claimed in Claim 2, wherein said multi-crankshaft engine includes two uppermost crankshafts, each driven by twin banks of cylinder-and-piston units in V-arrangement, so that each of said generators coupled to the two lowermost crankshafts has a power output capacity of substantially one sixth of the total power ouput capacity of the power plant.

4. A power plant as claimed in any one of the preceding Claims, wherein one of

said generators is adapted to be electrically connected to another of said generators so as to transmit thereto any excess of the electric current generated, the last-mentioned generator thus acting as a motor.

5. A power plant as claimed in any one of the preceding Claims, wherein a multi-crankshaft engine comprises at least two crankshafts spaced vertically one above the other, each of said vertically spaced crankshafts having one of said generators coupled thereto.

6. A power plant, substantially as shown in, and hereinbefore described with reference to, the accompanying drawings.

Dated this 29th day of December, 1949.

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1 SHEET

This drawing is a reproduction of the Original on a reduced scale.

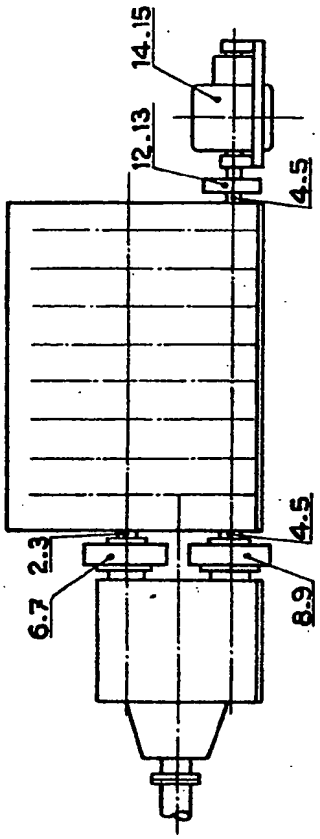

Fig. 2

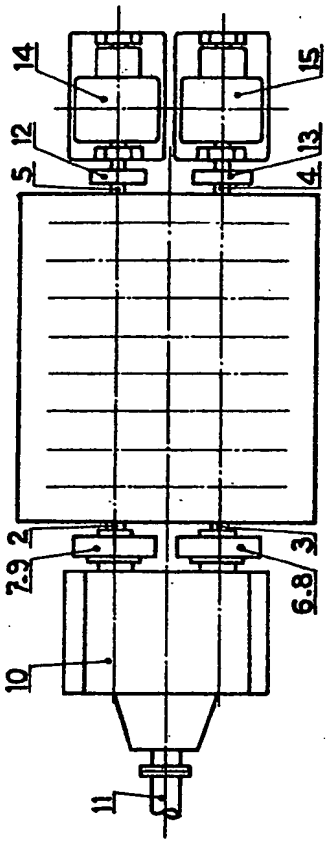

Fig. 3

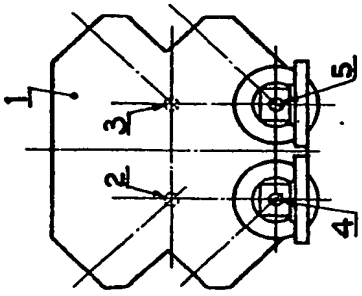

Fig. 1